Assessment System (AIRDAS) onboard the U.S. Forest Service (USFS) twin-engine Navajo was used to detect and characterize wildland fires and prescribed burns for various government agencies. The AIRDAS is a unique, four-channel line scanner that is well calibrated for measuring fire intensities and fire-line dimension. The data collected during these missions supported agency operations as well as NASA's fire research objectives. Multiple flights were made over wildfires in California to support firefighting activities and mitigation efforts. Additional flights were made for the government of Mexico, Bureau of Indian Affairs (Colorado), National Center for Atmospheric Research (Alaska), and Association of Bay Area Governments (Diablo Mountains). In all cases, the AIRDAS characterized fire-front movement, smoke production, and fire intensity for near-real-time management objectives and research applications. The results of these flights demonstrated the utility of AIRDAS for disaster management and provided fire information valuable to ecosystem and atmospheric research.

Collaborators in this research include Philip Riggan and Robert Lockwood (U.S. Forest Service), Jóao Antonio Peréira (IBAMA, Brazil), Eric Stoner (U.S. Aid for International Development—Brazil), Heliosa Miranda and Antonio Miranda (University of Brasilia, Brazil), and Thelma Krug (Brazilian Space Institute, Brazil).

Point of Contact: J. Brass
(650) 604-5235
jbrass@mail.arc.nasa.gov

Modeling Leaf and Canopy Reflectance

Lee Johnson, Christine Hlavka

Leaf/canopy model simulations and measured data were used to derive information on the form and strength of the nitrogen (N) "signal" in near-infrared (1100–2500 nanometer (nm)) spectra of fresh leaves. Simulations across multiple species indicated that in total, protein absorption decreased near-infrared reflectance and transmittance by up to 1.8% and 3.7% respectively, and all other inputs held constant. Associated changes in spectral slope were generally in the range of ±0.02% per nanometer. Spectral effects were about an order of magnitude more subtle for a smaller, though potentially ecologically significant, change in N concentration of 0.5% over measured. Nitrogen influence on spectral slope was fairly consistent across four empirical data sets as judged by wavelength dependence of N correlation. The observed and simulated data showed similar trends in sensitivity to N variation. Further, these trends were in reasonable agreement with locations of absorption by protein-related organic molecules. Improved understanding of the form and strength of the N signal under differing conditions may allow development of reasonably robust spectral measurement and analysis techniques for "direct" (based strictly upon N-related absorption features) N estimation in fresh leaves. A pragmatic approach for remote sensing might additionally consider surrogate measures such as chlorophyll concentration or canopy biophysical properties.

Collaborators in this research include Barry Ganapol (Departments of Aerospace/Mechanical Engineering and Hydrology/Water Resources, University of Arizona) and Barbara Bond (Department of Forest Science, Oregon State University).

Point of Contact: L. Johnson
(650) 604-3331
ljohnson@mail.arc.nasa.gov